



# Air Force Research Laboratory|AFRL

*Science and Technology for Tomorrow's Air and Space Force*

## **Success Story**

### **TITLE III TITANIUM MATRIX COMPOSITE TURBINE ENGINE COMPONENT PROJECT**



A viable titanium matrix composite (TMC) supplier base for military and commercial applications with affordable TMC products provides commonality and volume production. Also, TMC provides improved engine performance of range, payload, and fuel efficiency in support of the warfighter.



Air Force Research Laboratory  
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Materials and Manufacturing  
Emerging Technologies

## Accomplishment

A Title III project with the Manufacturing Technology Division of the Materials and Manufacturing Directorate, under a cooperative agreement with the Titanium Matrix Composite Turbine Engine Component Consortium (TMCTECC), established a viable supplier base and reduced the cost of manufacturing TMC components for military and commercial applications. This marked the first production of a TMC component in aircraft gas turbine engines. General Electric Aircraft Engines will use a TMC Nozzle Compression Link in the General Electric-built F110 engine for the F-16.

## Background

TMC is an advanced composite material of titanium reinforced with either silicon carbide particulate or filament. Parts fabricated with TMC are significantly stronger, lighter, and considerably more resistant to the stress of extreme temperatures than conventional titanium or super-alloys. They also provide increased performance (range, payload, and fuel efficiency).

This technology is key to improvements in propulsion systems for the next generation of commercial and military aircraft. The directorate expects substantial cost, performance, and durability benefits from the use of TMC components in transport and fighter aircraft engines. Other potential applications for TMCs include airframes, medical equipment, and chemical processing.

TMCs are very expensive, and the production base did not exist to routinely produce affordable, high-quality components. The directorate's Title III program objective was to ensure the TMC supplier community was self-sustaining without the need for government subsidy. Under the Title III project, the TMCTECC aim was to mature the TMC fabrication industry and deploy advanced gas turbine engines in the form of fan blades, fan frames, actuators, rotors, vanes, cases, ducting, shafts, and liners.

A major step in that direction was reducing the cost of manufacturing the nozzle compression link by more than 66%. While its competing metal part remains less expensive, continuing cost reduction actions and improvements in manufacturing processes will make TMC components more economically attractive for a broader range of military and commercial applications.

## Additional information

To receive more information about this or other activities in the Air Force Research Laboratory, contact TECH CONNECT, AFRL/XPTC, (800) 203-6451 and you will be directed to the appropriate laboratory expert. (03-ML-03)